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WALLACE'S GEOGRAPHICAL DISTRIBUTION OF ANIMALS

The Geographical Distribution of Animals, with a Study of the Living and Extinct Faunas, as Elucidating the Past Changes of the Earth's Surface. By Alfred Russel Wallace. Two Vols. 8vo. (London: Macmillan and Co., 1876.)

THE question of the number and boundaries of the primary zoological regions of the Globe has recently been discussed by Prof. Newton in his article on "Birds," in the new edition of the "Encyclopædia Britannica." After remarks on the failure of previous writers to solve this problem in a satisfactory manner, Prof. Newton comes to the conclusion that the outlines of distribution laid down in 1857 by Mr. Sclater, although founded only upon the study of the erratic class of birds, have "not merely in the main, but to a very great extent in detail, met with the approval of nearly all those zoologists who have since studied the subject in its bearing upon the particular classes in the knowledge of which they themselves stand pre-eminent." In point of fact, Mr. Wallace himself was one of the first naturalists to accept Mr. Sclater's views on this subject. Writing from the remote island of Batchian, in the Indian Archipelago, in March 1859, after perusing Mr. Sclater's well-known memoir on the Geographical Distribution of Birds,¹ Mr. Wallace says, in a letter to Mr. Sclater published in the first volume of the *Ibis*,² "With your division of the earth into six grand zoological provinces I perfectly agree, and I believe they will be confirmed by every other department of zoology as well as by botany." In the two excellent volumes now before us, in which are embodied the results of several years continuous labour upon this and kindred branches of the same subject, it will be seen that Mr. Wallace has not altered his opinion. The six great primary zoological regions of the globe proposed by Mr. Sclater in 1857 are fully adopted, and form the basis of Mr. Wallace's whole treatment of the subject. But one slight change even in their nomenclature is made—that of substituting "Oriental" as the name of the Region embracing South Asia and the adjacent islands for Mr. Sclater's term "Indian." In fact, after discussing the general principles and phenomena of distribution and what little we as yet know concerning the distribution of extinct animals, the main portion of Mr. Wallace's volumes is occupied by an elaborate sermon on Mr. Sclater's text, and on its application to other classes of animals. The various phenomena of life exhibited in the Palearctic, Ethiopian, Oriental, Australian, Neotropical, and Nearctic regions are treated of in succession, and their similarities and their differences are discussed. To this is added a sketch of the geographical distribution of the principal families of terrestrial animals arranged systematically, which forms the fourth part of this important work. Of this last portion, which is, in fact, a book of reference containing an account of the distribution of all the families, and

of most of the genera of the higher animals arranged in systematic order, we propose to speak in a subsequent article. For the present we will confine our attention to the first three parts of Mr. Wallace's work.

The introductory chapter, with which the first volume of the "Geographical Distribution of Animals" is commenced, although it states the object of the work plainly enough to the mind of the scientific reader, seems a little too brief and concise to explain the nature of the problem under discussion to the general public. It must be borne in mind that the very idea of the existence of any regular laws of distribution is a novelty to most people—even, we regret to say, to many who call themselves naturalists. It is to be regretted, therefore, we think, that Mr. Wallace has not devoted a few more pages to the general explanation of the subject of which he treats, to the pointing out of the many subordinate problems which it involves, and in particular to the further explanation and definition of such technical terms as "*habitat*," "stations," "range," and "representative species," which confront us in some of the very first pages of his work.

In his second chapter Mr. Wallace discusses the means by which animals are dispersed, and devotes a good deal of space to the question of migration. Now, migration is, no doubt a very important phenomenon, but whether it has much to do with the general theory of distribution appears to be rather doubtful. It occurs only in one or two groups of animals; and, as Mr. Wallace himself observes, "we must, except in special cases, consider the true range of a species to comprise all the area which it occupies regularly for any part of the year." Migration, therefore, primarily affects the distribution of a species within its own specific area, and only has to do with the general question of distribution so far as it may increase the tendency of a species to vary its range. With Mr. Wallace's views on the subject of dispersal generally we cordially agree. There can be no question that, in the "glacial epoch" and in the more recent geological changes which have taken place on the earth's surface, the key of the present complicated phenomena of distribution should be sought, although many of them have had a much earlier origin. "Almost every mile of land-surface has been again and again depressed beneath the ocean; most of the great mountain chains have either originated or greatly increased in height during the Tertiary period; marvellous alterations of climate and vegetation have taken place over half the land-surface of the earth; and all these vast changes have influenced a globe so cut up by seas and oceans, by deserts and snow-clad mountains, that in many of its more isolated land-masses, ancient forms of life have been preserved, which, in the more extensive and more varied continents have long given way to higher types."

Mr. Wallace now proceeds to enter upon the grand question of Zoological Regions, entirely ignored, as he truly says, by the older school of naturalists. To them, provided they got the object, it little mattered whence it came. "The Brazils," the "East Indies," or the "South-sea Islands," was considered *ample* information as to the locality of any specimen, even if it were thought necessary to give such information at all. How could such men appreciate the idea of Zoological Regions? They

¹ See "Journal of the Proceedings of the Linnean Society," Zoology, ii.

² Letter from Mr. Wallace concerning the Geographical Distribution of Birds. (*Ibis*, 1859, pp. 449.)

had a sort of vague notion that certain forms were peculiar to hot climates, and that certain others were only found in cold countries, but that was about all they knew or cared to know. Of the necessity of precise knowledge on the subject of locality they were absolutely incredulous.

"To the modern naturalist, on the other hand," as Mr.

Wallace most truly observes, "the native country (or 'habitat' as it is technically termed) of an animal, or a group of animals, is a matter of the first importance; and as regards the general history of life upon the globe, may be considered to be one of its essential characters. The structure, affinities, and habits of a species, now form only a part of its natural history.

"We require also to know its exact range at the present day and in prehistoric times, and to have some



FIG. 1.—Forest in Borneo.

knowledge of its geological age, the place of its earliest appearance on the globe, and of the various extinct forms most nearly allied to it. To those who accept the theory of development as worked out by Mr. Darwin, and the views as to the general permanence and immense antiquity of the great continents and oceans so ably developed by Sir Charles Lyell, it ceases to be a matter of

surprise that the tropics of Africa, Asia, and America should differ in their productions, but rather that they should have anything in common. Their similarity, not their diversity, is the fact that most frequently puzzles us."

Yet, in spite of the increased attention paid to locality by Swainson, Waterhouse, Strickland and all the more

highly educated class of naturalists within the last fifty years, it was not until 1857 that the plan of determining the great zoological regions of the earth's surface not from *à priori* reasons of heat and cold, nor from the ordinary views of geographers, but by the minute study of the actual ranges of the more important and best known groups of animals was suggested. Mr. Sclater's Regions,

then originally established from consideration of the ranges of the principal families and genera of birds, were quickly applied by Dr. Günther to reptiles and batrachians, and subsequently by Mr. Sclater himself to mammals. Working from the same stand-point, various naturalists have of late years tried to improve upon them, amongst others Mr. Blanford, Mr. Blyth, and



FIG. 2.—Scene in New Guinea.

Prof. Huxley. Mr. Wallace will have none of these—nay, so convinced is he of the correctness of Mr. Sclater's original "happy thoughts"—that he will not even listen to the inventor's own emendations of his original regions. "So that we do not violate any clear affinities"—he observes, "or produce any glaring irregularities, it is a positive, and by no means an unimportant advantage to

have our named regions approximately equal in size, and with easily defined and easily remembered boundaries."

He therefore condemns "all elaborate definitions of inter-penetrating frontiers" and "regions extending over three-fourths of the land-surface of the globe" as "most inconvenient—even if there were not such differences of opinion about them." He admits that the "most radical

zoological division of the earth" is made by "separating the Australian regions from the rest," and that the best natural division of the remainder is effected by cutting off the Neotropical region. We should then have three primary zoological regions, which first Prof. Huxley, and afterwards Mr. Sclater, in his oral lectures on geographical distribution seemed to consider as of nearly equal importance. On this Mr. Wallace remarks that "in isolation and speciality, determined by what they want, as well as by what they possess, the Australian and Neotropical regions are undoubtedly each comparable with the rest of the earth. But in richness and variety of forms they are both very much inferior, and are much more nearly comparable with the separate regions which compose it." After discussing this subject at some length, and disposing shortly of Mr. Allen's system of "circumpolar zones," Mr. Wallace comes to the conclusion that a consideration of all the facts zoological and palæontological, indicates that the great northern division, or *Arctogæa*, is as much more important than either Australia or South America, as its four component parts are less important. He therefore reverts to the six original regions proposed by Mr. Sclater in 1857, as the most workable, and most conveniently adapted for the study of zoological distribution.

Thus much having been settled, Mr. Wallace proceeds to point out the limits of the six great regions, and to indicate the sub-regions into which they may be best divided. As regards the latter part of this task there is much difficulty. It must be confessed that the sub-regions in many cases are as yet only approximately determined, and that those adopted by Mr. Wallace are in several instances open to serious question. For example, "the great central mass of South America, from Venezuela to Paraguay" is constituted in the present work as a single division of the Neotropical region under the name of the "Brazilian Sub-region." But there can be no doubt that within this area there are two, if not three, distinct sub-regions which deserve recognition. The fauna of south-eastern Brazil, so admirably investigated by Prince Max. of Neuweid, Burmeister, Reinhardt, and other well-known naturalists, is very distinct from that of the great Amazonian valley, and the adjacent flats of Guiana and the Orinoco. Many genera are peculiar to each of them, and a whole host of representative species perform similar functions within the respective areas. Herr von Pelzeln's divisions of the Neotropical region, and those employed by Messrs. Sclater and Salvin in their papers published in the Zoological Society's *Proceedings*, are much more natural than those suggested by Mr. Wallace. We fear that in spite of what he says on the subject our author has rather allowed a hankering after uniformity to lead him astray and to induce him to restrict his sub-regions to four in each case.

The chapter on Classification which next follows, and concludes the first portion of the work, contains some very apposite remarks. A natural classification of animals is, as Mr. Wallace observes, of first-rate importance in discussing matters of distribution. But, except in the case of a few groups, we have by no means yet attained to a natural classification of animals, and even as regards these we are, in the opinion of many naturalists, still very far from it. It is only therefore some few of the classes

of animals that are sufficiently known to be useful for the study of distribution. As such Mr. Wallace selects the Vertebrata, the butterflies, and six families of Coleoptera amongst the insects, and the terrestrial and fresh-water land-shells amongst the Mollusca. Of these better-known groups he gives us tables of the arrangement which he proposes to adopt for the illustration of his remarks on their geographical distribution.

(To be continued.)

OUR BOOK SHELF

Notes on Collecting and Preserving Natural History Objects. By J. E. Taylor, E. F. Elwin, Thos. Southwell, Dr. Knaggs, E. C. Rye, J. B. Bridgman, Prof. Ralph Tate, Jas. Britten, Prof. Buckman, Dr. Braithwaite, Worthington G. Smith, Rev. Jas. Crombie, W. H. Grattann. Edited by J. E. Taylor, Ph.D., F.L.S., F.G.S., &c. (London: Hardwicke and Bogue, 1876.)

THIS is a republication of a series of papers from *Science Gossip*; and the names of the respective authors is a sufficient guarantee for the value and accuracy of the information it affords. It is a very useful book to put into the hands of young persons with some taste for natural history but quite ignorant of how to collect and what to observe; since it devotes as much space to the latter branch as to the former, and is thus a more instructive work than its title indicates. The subjects discussed are—geological specimens, bones, birds' eggs, lepidoptera, beetles, hymenoptera, land and fresh-water shells, flowering plants, grasses, mosses, fungi, lichens, and seaweeds. It is a pity that a few other essays were not obtained—on birds, mammals, reptiles, fresh-water fishes, crustacea, spiders, and sea-shells—so as to make the book somewhat more complete as regards "Natural History Objects;" but so far as it goes it is an excellent little work, and is perhaps better adapted to encourage an incipient taste for the study of nature than many more pretentious volumes. The chapters on birds' eggs, butterflies, and beetles, are especially full and interesting; while those on bones and fungi are valuable, as likely to incite the reader to take up the study of these somewhat neglected objects.

A. R. W.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Harris Cubit of Karnak

As the measures of this cubit hitherto published are more or less incomplete, the following series may be worth attention.

For permission to examine this relic, I am indebted to Dr. Birch, under whose care it is placed in the British Museum; and who, with his usual courtesy, gave every facility for its measurement.

The readings were taken by laying this wooden cubit on a brass standard scale, divided to tenths of an inch and to millimetres, with its divided face at right angles to that of the scale. Two observers then read the values of the divisions in both inches and metres, giving four readings in all, at about 66° F. The standard scale has since been kindly verified by Mr. H. W. Chisholm, Warden of the Standards, and its error is not of such an amount as to affect the figures here given; it is now in the Loan Collection of Scientific Apparatus (200), the sole representative at South Kensington of Kater's standards.

The readings were mapped on divided paper, and the mean result for each line carefully estimated, with its probable error, by the two observers: and though the following readings of the divisions are of course far from the limit of attainable accuracy, yet as their errors are but a small fraction of those of the gradua-